OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **FLINTS POND** the program coordinators recommend the following actions. *We would like to encourage the association to conduct more sampling events in the future. With a limited amount of data it is difficult to determine water quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the lake several times over the course of the season.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *worsening* in-lake chlorophyll-a trend. The concentration this season was the lowest in eight years, however this was based on only one test, and further testing is recommended to better understand the abundance of algae in the lake. The chlorophyll-a concentration was below the state mean this year. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. The water clarity in August was the highest it has been in six years, but remains below the state mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show an overall *worsening* trend for in-lake phosphorus levels, although phosphorus concentrations have decreased in the last two years (however, this is based on only one test per year). Concentrations were below the state median for the first time since 1993 in the hypolimnion and 1992 in the epilimnion. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- We continue to recommend that the association conduct more sampling during the summer. Collecting more samples will help to understand the water quality of the pond. For your convenience, we suggest using the Franklin Pierce College Water Quality Lab, which is open at the college in Rindge. This lab was established to reduce the driving time for the VLAP monitors in the southwestern region of the state. This lab will ensure the quality of the analyses, since the time spent driving to the lab is much less than the drive to Concord. We encourage the lake association to utilize this lab next summer for all sampling events (except for our annual visit, of course!). To find out more about the lab, or to pick up bottles and equipment, call Michele Hood, the lab manager, at (603) 899-4384.

- Conductivity increased slightly in the pond this year (Table 6). We will watch for this trend to continue.

- Dissolved oxygen was again depleted at the bottom of the pond in August (Table 9). This has occurred since Flints Pond joined VLAP. Reducing external sources of phosphorus can help to slow the aging process in the pond. Excess anthropogenic phosphorus from the watershed can enter the lake, causing increased plant and algal productivity. When these increased populations begin to die off, they sink to the bottom of the pond where bacterial decomposition takes place. In the process of breaking down the organic matter at the bottom of the pond, these bacteria use up oxygen... more organic matter means more decomposition, which leads to more oxygen depletion.

- The monitor mentioned in August that the variable milfoil normally found in the middle of the pond did not regrow this summer. The association is apparently still waiting for funding to dredge the pond. The dredging project may or may not help to reduce the population of milfoil in the pond. If dredging does occur, it will be very important to be sure to contain and remove all loosened and floating plant fragments to prevent milfoil from re-infesting the pond. Please keep us informed on the progress of this project.

NOTES

- Monitor's Note (8/23/00): The outlet was not sampled, due to stagnant waters.

USEFUL RESOURCES

Save Our Streams Handbook for Wetlands Conservation and Sustainability. (800) BUG-IWLA, or visit www.iwla.org

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, *WD-BB-9*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

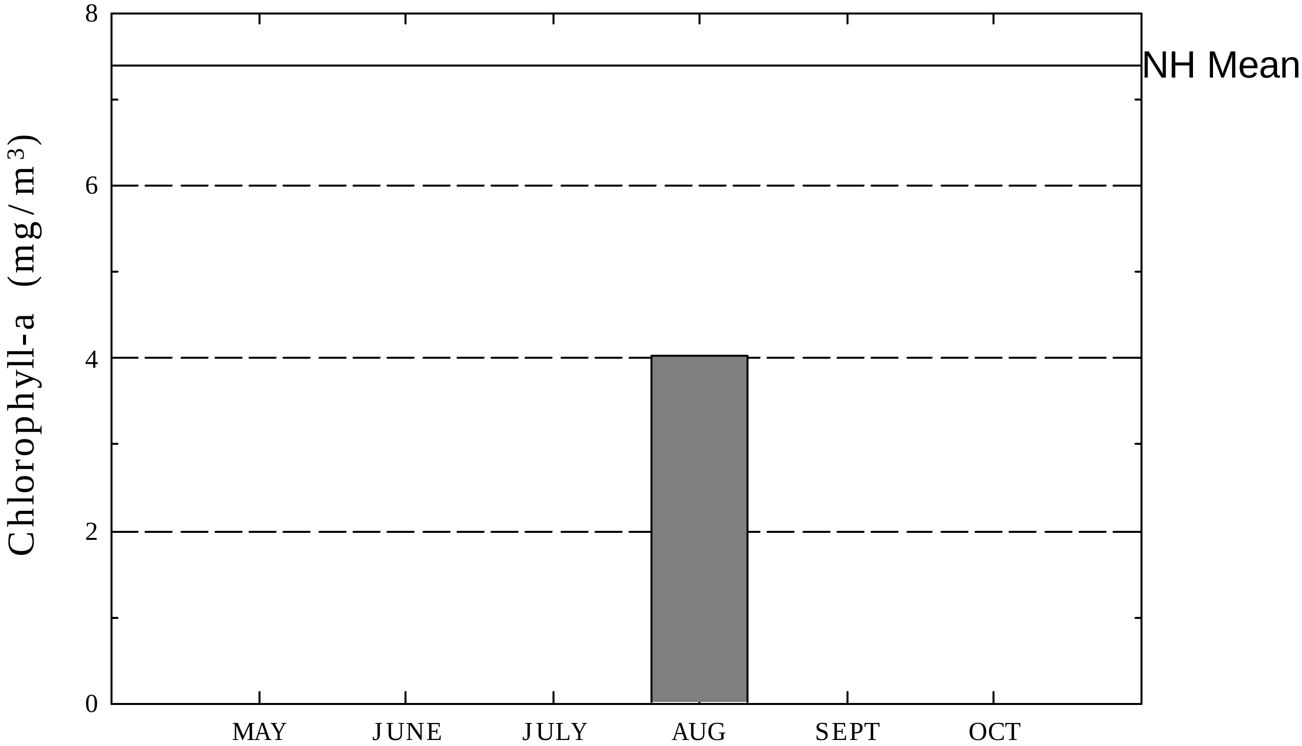
Septic Systems and Your Lake's Water Quality, *WD-BB-11*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, *NHDES-WD 97-8*, NHDES Booklet, (603) 271-3503

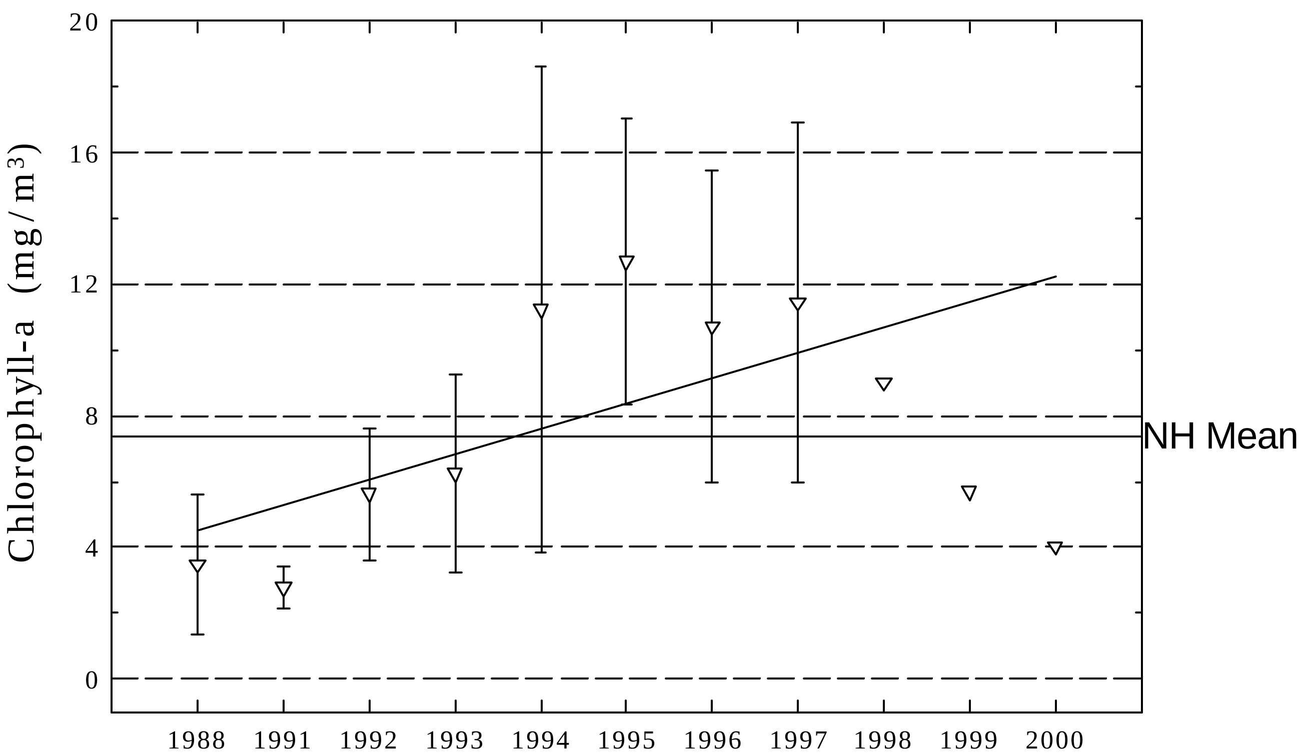
Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Flints Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



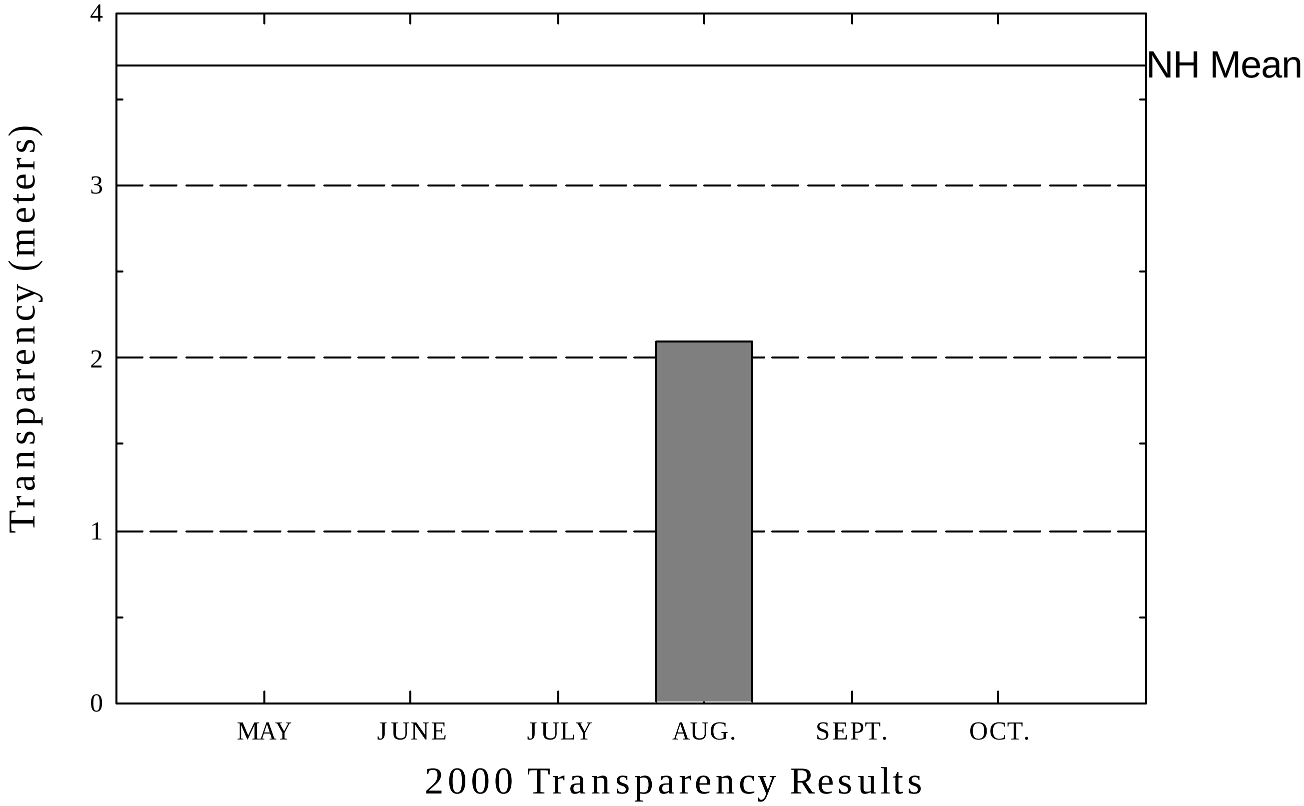
2000 Chlorophyll-a Results

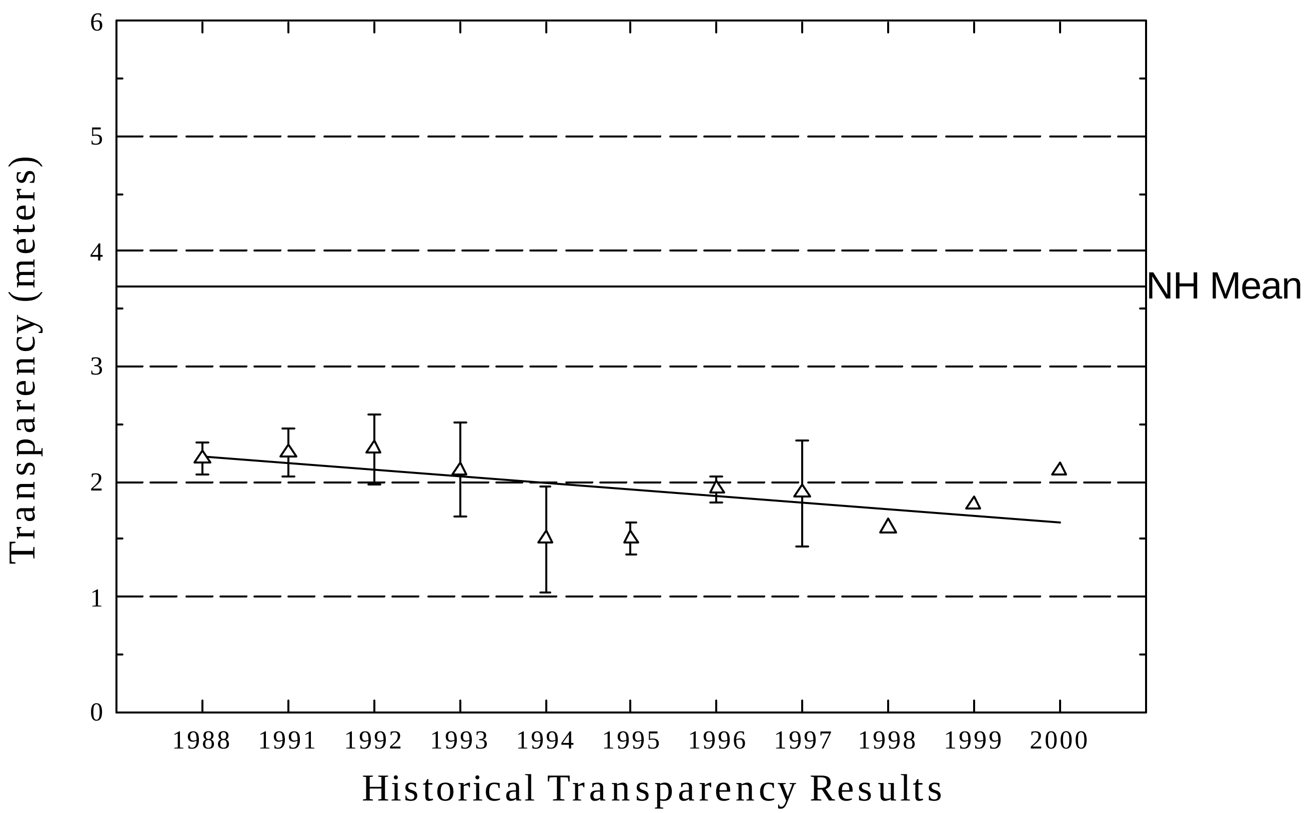


Historical Chlorophyll-a Results

Flints Pond

Figure 2. Monthly and Historical Transparency Results





Flints Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

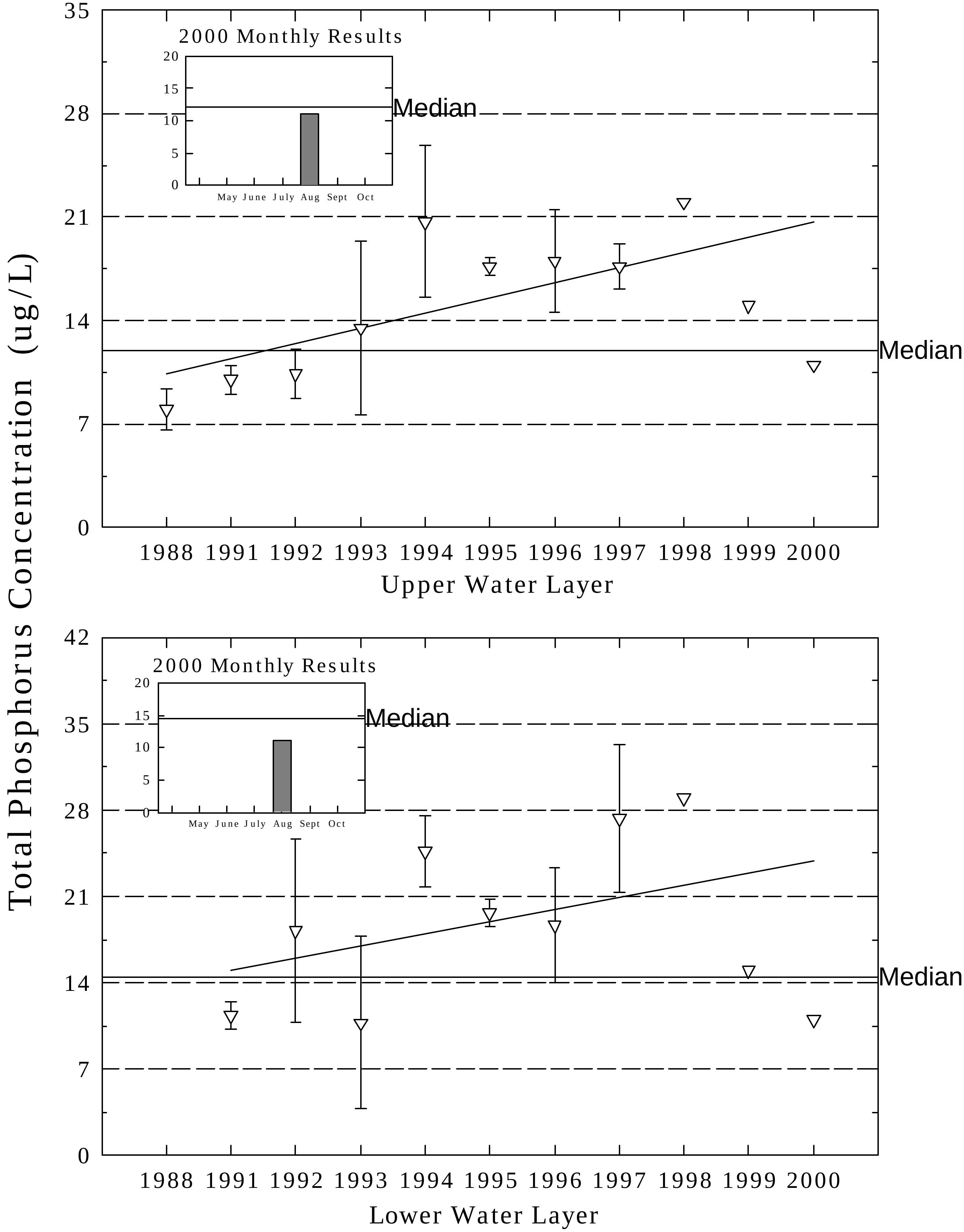


Table 1.

FLINTS POND

HOLLIS

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1988	1.90	6.50	3.92
1991	1.83	4.98	3.29
1992	3.65	8.42	5.63
1993	2.84	8.85	5.18
1994	4.29	19.00	10.79
1995	7.94	16.42	12.69
1996	5.27	13.87	10.72
1997	6.84	17.50	11.44
1998	9.01	9.01	9.01
1999	5.69	5.69	5.69
2000	4.03	4.03	4.03

Table 2.

FLINTS POND

HOLLIS

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
05 / 06 / 1991	DINOBRYON	39
	TABELLARIA	13
	CERATIUM	12
05 / 16 / 1992	DINOBRYON	40
	CERATIUM	16
	STAURASTRUM	11
06 / 06 / 1993	CERATIUM	41
	FILAMENTOUS SPP	12
	BOTRYOCOCCUS	10
06 / 11 / 1994	FILAMENTOUS GREEN ALGAE	81
	PLEUROTAENIUM	7
	TABELLARIA	6
06 / 20 / 1995	SPHAEROCYSTIS	51
	GLOEOCYSTIS	34
	CERATIUM	9
06 / 27 / 1996	SYNURA	77
	CERATIUM	21
	SPHAEROCYSTIS	2
06 / 03 / 1997	CERATIUM	94
	MALLOMONAS	2
	DINOBRYON	1
07 / 09 / 1998	CERATIUM	62
	ANABAENA	10
	GYMNODINIUM	9
08 / 11 / 1999	CERATIUM	83
	MALLOMONAS	8
	STAURASTRUM	4
08 / 23 / 2000	DINOBRYON	79
	MALLOMONAS	8
	STAURASTRUM	8

Table 3.

FLINTS POND

HOLLIS

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1988	1.8	2.4	2.1
1991	2.0	2.5	2.3
1992	2.0	2.7	2.2
1993	1.5	2.6	2.1
1994	1.0	2.3	1.6
1995	1.4	1.6	1.5
1996	1.8	2.0	1.9
1997	1.5	2.4	1.9
1998	1.6	1.6	1.6
1999	1.8	1.8	1.8
2000	2.1	2.1	2.1

Table 4.

FLINTS POND
HOLLIS

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	7.20	7.64	7.42
	1992	7.56	8.22	7.79
	1993	7.39	8.79	7.68
	1994	7.23	7.54	7.35
	1995	6.78	7.57	7.10
	1996	6.96	7.10	7.04
	1997	7.22	7.48	7.31
	1998	7.06	7.06	7.06
	1999	7.04	7.04	7.04
	2000	7.18	7.18	7.18
HYPOLIMNION				
	1991	7.20	7.63	7.33
	1992	7.32	7.61	7.44
	1993	6.98	7.56	7.21
	1994	7.03	7.49	7.29
	1995	7.15	7.23	7.19
	1996	6.81	7.13	6.93
	1997	7.09	7.45	7.20
	1998	6.63	6.63	6.63
	1999	7.03	7.03	7.03
	2000	7.14	7.14	7.14
OUTLET				
	1991	6.90	7.26	7.04

Table 4.

FLINTS POND

HOLLIS

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1992	6.87	7.41	7.05
	1993	6.72	6.88	6.79
	1994	6.52	6.98	6.73
	1995	6.79	7.44	7.00
	1996	6.51	6.79	6.65
	1997	7.05	7.12	7.08
	1998	6.41	6.41	6.41
	1999	6.94	6.94	6.94

Table 5.

FLINTS POND

HOLLIS

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	21.60	30.00	25.43
1992	25.80	44.10	36.46
1993	33.40	47.30	40.80
1994	34.50	42.00	38.52
1995	35.80	43.90	39.03
1996	29.90	31.40	30.87
1997	22.70	34.10	30.23
1998	29.40	29.40	29.40
1999	35.10	35.10	35.10
2000	35.80	35.80	35.80

Table 6.

FLINTS POND
HOLLIS

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	123.6	147.1	135.5
	1992	126.6	148.4	136.0
	1993	132.5	161.0	149.5
	1994	138.8	155.3	147.1
	1995	135.8	147.0	143.1
	1996	119.0	125.9	123.5
	1997	109.8	125.6	119.6
	1998	108.1	108.1	108.1
	1999	139.8	139.8	139.8
	2000	140.6	140.6	140.6
HYPOLIMNION				
	1991	125.0	148.2	135.9
	1992	117.6	148.8	135.6
	1993	128.0	164.2	149.7
	1994	143.9	156.4	148.7
	1995	135.1	149.6	143.7
	1996	121.1	128.8	125.3
	1997	108.8	126.9	120.8
	1998	115.1	115.1	115.1
	1999	138.6	138.6	138.6
	2000	140.1	140.1	140.1
OUTLET AT 130				
	1993	204.0	204.0	204.0

Table 6.

FLINTS POND
HOLLIS

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1991	129.7	190.1	149.8
	1992	139.5	220.0	187.7
	1993	204.0	224.0	214.0
	1994	143.8	303.0	224.2
	1995	189.1	200.0	194.5
	1996	138.6	193.4	169.1
	1997	136.2	173.1	154.6
	1998	129.4	129.4	129.4
	1999	173.1	173.1	173.1

Table 8.

FLINTS POND
HOLLIS

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1988	7	9	8
	1991	9	13	11
	1992	8	12	10
	1993	8	20	13
	1994	14	25	19
	1995	17	18	17
	1996	16	22	18
	1997	16	19	17
	1998	22	22	22
	1999	15	15	15
	2000	11	11	11
HYPOLIMNION				
	1991	10	15	12
	1992	13	31	18
	1993	2	36	15
	1994	23	33	27
	1995	19	21	19
	1996	16	24	18
	1997	21	33	27
	1998	29	29	29
	1999	15	15	15
	2000	11	11	11

Table 8.

FLINTS POND
HOLLIS

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1988	7	7	7
	1991	10	19	16
	1992	12	19	14
	1993	30	95	62
	1994	24	24	24
	1995	24	39	31
	1996	15	29	19
	1997	18	25	21
	1998	26	26	26
	1999	22	22	22

Table 9.

FLINTS POND

HOLLIS

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 23, 2000			
0.1	22.0	6.3	72.5
1.0	21.9	6.4	73.1
2.0	21.1	5.0	56.7
3.0	20.7	0.8	9.1

Table 10.

FLINTS POND

HOLLIS

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
May 4, 1991	2.5	14.0	9.3	90.3
May 16, 1992	2.5	15.0	4.6	45.7
June 15, 1993	2.0	19.0	0.2	2.2
July 22, 1993	2.0	20.6	0.3	3.6
June 11, 1994	2.0	16.1	5.1	53.2
June 20, 1995	2.0	21.0	4.6	51.0
July 9, 1998	2.5	18.4	0.6	6.0
August 11, 1999	2.0	22.7	4.3	50.3
August 23, 2000	3.0	20.7	0.8	9.1

Table 11.

FLINTS POND
HOLLIS

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1994	1.0	1.0	1.0
	1997	1.0	2.4	1.6
	1998	0.5	0.5	0.5
	1999	3.2	3.2	3.2
	2000	1.4	1.4	1.4
HYPOLIMNION				
	1994	1.0	1.0	1.0
	1997	1.5	10.0	4.9
	1998	0.7	0.7	0.7
	1999	3.2	3.2	3.2
	2000	1.4	1.4	1.4
OUTLET				
	1997	1.2	1.2	1.2
	1998	1.0	1.0	1.0
	1999	0.8	0.8	0.8